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Wi-Fi TECHNOLOGIES

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Wi-Fi is a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections. The Wi-Fi Alliance, the organization that owns the Wi-Fi (registered trademark) term, defines Wi-Fi as any "wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards."

A Wi-Fi enables a device, such as a personal computer, a video game console, a smart phone, or a digital audio player, to connect to the Internet. The coverage of one or more interconnected access points – called hotspots when offering public access – generally comprises an area, the size of which can be a few rooms but may be expanded to cover many square miles, depending on the number of access points with overlapping coverage.

Wi-Fi works with no physical wired connection between a sender and a receiver by using radio frequency (RF) technology, a frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. The cornerstone of any wireless network is an access point (AP). The primary job of an access point is to broadcast a wireless signal that computers can detect and "tune" into. In order to connect to an access point and join a wireless network, computers and devices must be equipped with wireless network adapter.

In 2010 Wi-Fi technology has spread widely within business and industrial sites. In business environments, just like other environments, increasing the number of Wi-Fi access points provides network redundancy, support for fast roaming and increased overall network-capacity by using more channels or by defining smaller cells. Wi-Fi enables wireless voice-applications (VoWLAN or WVOIP).

Over the years Wi-Fi implementations have moved toward "thin" access points, with more of the network intelligence housed in a centralized network appliance, relegating individual access points to the role of "dumb" transceivers. Outdoor applications may utilize mesh topologies.

As any other contemporary technology Wi-Fi has a lot of advantages as well as some disadvantages. First of all, Wi-Fi allows the deployment of local area networks (LANs) without wires for client devices, reducing the costs of network deployment and expansion. Spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs.

Secondly, since initially Wi-Fi was used in place of only the 2.4GHz 802.11b standard, then the Wi-Fi Alliance has expanded the generic use of the Wi-Fi term to include any type of network or WLAN product based on any of the 802.11 standards, including 802.11b, 802.11a, dual-band, and so on, in an attempt to stop confusion about wireless LAN interoperability.

As for limitations, a Wi-Fi signal occupies five channels in the 2.4 GHz band; any two channels whose channel numbers differ by five or more, such as 2 and 7, do not overlap. The oft-repeated adage that channels 1, 6, and 11 are the only non-overlapping channels is,

therefore, not accurate; channels 1, 6, and 11 comprise the only group of three non-overlapping channels in the U.S.

Yet, the Internet protocol does not perform well in the presence of noise when run with WiFi as the physical layer. TCP has been tuned for a wired network in which packets lost due to noise is very rare and packets are lost almost exclusively due to congestion. On a wireless network, noise is common. This difference causes TCP to greatly slow or break transmission when noise is significant.

In terms of the range Wi-Fi networks have limited operational area. A typical wireless router that uses 802.11b or 802.11g with a stock antenna might have a range of 32 m (120 ft) indoors and 95 m (300 ft) outdoors. The IEEE 802.11n can exceed that range by more than two folds. The range also varies with the frequency band. Wi-Fi in the 2.4 GHz frequency block has slightly better range than Wi-Fi in the 5 GHz frequency block.

Due to distance requirements for wireless LAN applications, Wi-Fi has fairly high power consumption compared to some other standards. The high power consumption of Wi-Fi results in a concern relating to battery life in mobile devices. Researchers have developed a number of "no new wires" technologies to provide alternatives to Wi-Fi for applications in which Wi-Fi's indoor range is not adequate and where installing new wires (such as CAT-5) is not possible or cost-effective.

The very limited practical range of Wi-Fi essentially confines mobile use to such applications as inventory-taking machines in warehouses or in retail spaces, barcode-reading devices at check-out stands, or receiving/shipping stations. Mobile use of Wi-Fi over wider ranges is limited, for instance, to uses such as in an automobile moving from one hotspot to another. Other wireless technologies are more suitable.

Nowadays there are a number of problems that should be solved in the field of Wi-Fi technologies.

The most common wireless encryption-standard, Wired Equivalent Privacy (WEP), appears be easily breakable even when correctly configured. Wi-Fi Protected Access (WPA and WPA2) encryption, which became available in devices in 2003, is aimed to solve this problem. Wi-Fi access points typically default to an encryption-free (open) mode. Novice users benefit from a zero-configuration device that works out-of-the-box, but this default does not enable any wireless security, providing open wireless access to a LAN.

Another problem is channel pollution. Wi-Fi pollution, or an excessive number of access points in the area, especially on the neighboring channel, can prevent access and interfere with other devices' use of other access points, caused by overlapping channels in the 802.11g/b spectrum, as well as with decreased signal-to-noise ratio (SNR) between access points. This can become a problem in high-density areas, such as large apartment blocks or office buildings with many Wi-Fi access points.

Additionally, other devices use the 2.4 GHz band: microwave ovens, security cameras, ZigBee devices, Bluetooth devices and (in some countries) Amateur radio, video senders, cordless phones and baby monitors, all of which can cause significant additional interference. It is also an issue when municipalities or other large entities (such as universities) seek to provide large area coverage.

No matter what somebody’s lifestyle is, Wi-Fi technology can play an important role in making it more productive, convenient and fun. Wi-Fi uses radio waves - just like cellular phones, TV and radio – to create reliable high-speed connections between computers, printers, gaming devices, cameras phones and home entertainment systems. One can use Wi-Fi at home, at work or on-the-go at hotspots worldwide.